SECTION 26 05 36
CABLE TRAYS FOR ELECTRICAL SYSTEMS

PART 1- GENERAL

1.1 DESCRIPTION

A. This section specifies the furnishing, installation and connection of raceway systems and wiring for the radiology equipment.

B. Radiology equipment and the high voltage cables will be furnished by the Government.

1.2 RELATED WORK

A. Section 13 49 00, RADIATION PROTECTION: Requirements for lead radiation shielding.

B. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements that are common to more than one section of Division 26.

C. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits, fittings, and boxes for raceway systems.

D. Section 26 05 39, UNDERFLOOR RACEWAYS FOR ELECTRICAL SYSTEMS: Under-floor raceway systems.

E. Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW): Cables and conductors.

1.3 SUBMITTALS

A. Submit in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

B. Shop Drawings:

1. Sufficient information, clearly presented, shall be included to determine compliance with the drawings and specifications.
2. Show size and location of raceway components, main feeders panels and pullboxes, ductwork and equipment provided by other trades, and radiology equipment items. Carefully coordinate with manufacturer’s shop drawings. Shop drawing approval is required by the radiology equipment manufacturer’s technical representative prior to fabrication and installation of the raceway and conductor system.

C. Certifications: Two weeks prior to final inspection, submit four copies of the following to the Contracting Officer’s Representative (COR):

1. Certification that the materials are in accordance with the drawings and specifications.

2. Certification, by the Contractor, that the complete installation has been properly installed and tested.
3. Certification, by the Contractor, that the radiology equipment manufacturer's representative has approved the complete installation.

1.4 APPLICABLE PUBLICATIONS

Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.

A. National Fire Protection Association (NFPA):
70-2005.....National Electrical Code (NEC)
99-2005.....Health Care Facilities

B. Underwriters Laboratories, Inc. (UL):
884-2005 .....Underfloor Raceways and Fittings

PART 2 - PRODUCTS

2.1 CABLE TROUGH RACEWAYS

A. General
1. Factory fabricate, assemble and fit
2. Material shall be steel
3. Coordinate dimensions of the straight lengths elbows, junction boxes and other components.
4. Hot dipped galvanized steel connections joiner plates on floor and ceiling cable trough.
5. Raceway bushings:
   a. Cast aluminum.
   b. Install when the radiology equipment is installed.
   c. Split ring type bushed nipples for the high voltage cables.
   d. Smooth edges of the openings in the raceways for the bushings.
6. Provide chase nipples and other components as required.
7. Protect cables at their egress from the raceways with fittings that are mechanically secure to the raceways
8. Provide 45 degrees sweep e1bow at every 90 degrees change in direction elbows shall have partitions.
9. Where gasketed openings are required in floor wall or ceiling troughs split covers shall be provided with fastening devices on both sides of the cover.

2.2 FLOOR TROUGH RACEWAY

A. Raceways in the floors shall be watertight in accordance with UL 884.
B. Sides and bottoms, 2 mm (0.0747 inch) minimum thickness.
C. Covers, 6 mm (1/4-inch) thick minimum. Covers shall be bare, carpet-insert, or tile-insert to match the existing floor covering or surface
D. Floor-trough covers shall be fully gasketed with screw fasteners.

2.3 WALL TROUGH RACEWAY

A. Flange mounted covers with screw fasteners for flush mounted installation.
B. Surface mounted covers with screw fasteners for surface mounted installations.
C. Sides, bottoms, and covers for renovations 2 mm (0.747 inch) minimum thickness
D. Wall duct, nominal 10 mm (3.5 inches) deep by 250 mm (10 inches) wide recessed into wall for control and power cables.

2.3 CEILING CABLE TROUGH

Cable trough nominal 10 mm (3.5 inches) deep by 250 mm (10 inches) wide with 10 mm (5/8 inches) support rods to permit inspection of cables above dropped ceiling.

PART 3 - EXECUTION

3.1 SYSTEM INSTALLATION

A. Provide as required by the NEC and NFPA 99 and the manufacturer’s shop drawings the raceways, barriers, conductors, boxes, disconnects, grounds and other equipment for the radiology equipment and the final connections to the equipment in accordance with the details shown on the drawings. The radiology equipment and the high voltage cables will be furnished by the Government. The Government will furnish the services of a manufacturer's representative to technically supervise the installation, connection, adjustment and testing of the equipment.
B. Coordinate the raceway systems with the floor, wall, and ceiling structural supports for the radiology equipment, the locations of the radiology equipment and its auxiliaries, and with the lead shielding in the walls, floors and ceilings:
   1. Prior to fabrication of the raceway systems, obtain detailed layout information from the COR for the radiology equipment and high voltage cables.

2. Install raceways with a minimum of bends in the shortest practical distance considering equipment and building layout. Individual raceway runs shall not exceed the radiology equipment manufacturer's specified maximum distances.
3. Raceways, boxes and devices recessed into or penetrating through lead shielded walls, floors and ceilings:
   a. Line or clad surfaces of the boxes and devices with the equivalent thickness of lead shielding shown for the room, except, the removable cover.
   b. Line or clad raceway surfaces with the equivalent thickness of lead shielding shown for the room.
   c. Overlap the lead shielding on boxes, devices and raceways with the lead shielding for walls, floors and ceilings by not less than one inch.
   d. Arrange the installations so radiation within the rooms will not penetrate the raceway paths through the lead shielded walls, floors and ceilings.

C. Interconnecting wiring shall be copper, stranded or solid, and have the type and size as required by the radiology equipment manufacturer. However, in no case shall the insulation class be less than 600 volts, or the conductor size for low voltage power and grounding wiring be less than 4 mm² (12 AWG), unless approved by the COR.

D. Equipment Grounding Conductors:
1. Install an equipment grounding conductor in each raceway. The conductor shall be copper, sized as shown, and shall have green insulation. The conductor size shall at a minimum be equal to the size of the largest current-carrying conductor present at that point.
2. Bond all of the equipment grounding conductors in each enclosure.
3. Trough-type raceway sections shall be made electrically continuous by short bonding jumpers between adjacent sections. Jumpers shall be exothermically bonded to each raceway section. Jumpers shall be sized per radiology equipment manufacturer's requirements.
4. Provide not less than one 3000mm (ten foot) equipment grounding conductor pigtail at each box or junction point where an item of equipment is connected.

5. The grounding conductors shall be continuous back to the electrical system ground from which the radiology equipment is served.

E. Install protective barriers between the high voltage power cables, the low voltage power conductors and medical systems conductors where conductors of different types share a common raceway component.

F. Install cables and conductors as required for the radiology equipment. Provide 3000 mm (ten-foot) pigtails on the wires at all the connection points to radiology equipment. Wiring shall be tagged and identified at each end.

G. Fit and preserve fill-in pieces of floor covering for the raceways. Install the fill-in pieces after the cables and conductors have been installed in the raceways.

H. In existing facilities where it is not feasible to provide radiology raceways as specified above:

1. Install point-to-point conduit and conductor systems for the radiology equipment.
2. Run the raceways for the high voltage cables in the shortest practicable manner as approved by the COR and the equipment manufacturer.
3. Line holes in the floors, walls and ceilings for conduit penetrations with equivalent thickness of lead sleeves curved or offset, caulked and flanged for adequate shielding so the X-rays will not penetrate the floors, walls and ceilings.

3.2 RADIATION THERAPY UNIT DOOR INTERLOCK

A. This requirement for interlocking applies to megavoltage therapy units.

B. For rooms having lead shielding within the walls for radiation therapy protection, install interlocking between the doors for each room and the therapy equipment within the room so the therapy equipment cannot be operated unless the doors are closed.

C. Interlock doors using doorjamb switches. Switches shall not be visible when the doors are closed.

D. Interlock the therapy equipment as recommended by the manufacturer of the X-ray equipment.

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